Weekly Report #5

Group Nr. 21: "Face Reconstruction"

February 15, 2022

1 Weekly Progress

Dataset. We managed to capture some datasets ourselves, using an Intel RealSense L515 as well as a Kinect v2 camera. For both cameras, we were able to align the color images to the depth data. We started using Kinect v2 data first, as we were able to re-use the camera parameters from the exercises, but think that we can integrate the other data into the same pipeline soon. After preprocessing of the data, Fig.**??** shows an example of the coloured reconstruction from the Kinect data.

Facial Landmarks and Basel Face Model. We have already detected the 2D facial landmarks on RGB frames last week. The next step is to estimate the head pose from Basel Face Model. In DLib, there are 68 detected landmarks on the 3D face. Hence, we need to manually select 68 points that represent the same landmarks on Basel Face Model. Fig.**??** shows the selected landmarks.

Initial Alignment. As we have landmarks of our data and the face model, we start to estimate the pose by Procrustes Algorithm.

- Tong Yan Chan (03722291): Data capturing and alignment, landmark selection of face model, alignment by procrustes algorithm, research on parametric face model
- Dushyant Anirudhdhabhai Dave (03728740): Mac setup of the libraries
- Daniel Schubert (03666228): Data capturing, research on face model
- Chang Luo (03759570): Data capturing and alignment, library research setup instructions

2 Problems

Mostly build system issues with the multitude of libraries under use which are different from system to system. We now have functioning builds for all team members and do not expect many additional libraries to come into play, so we hope for these problems to be mostly resolved now.

3 Plan

Our pipeline is currently coming together and we have the most relevant parts in separate algorithms, but not put together yet. We hope to achieve a first face tracking until the

next week.
The regular online meetup worked well for us, so we will continue doing that for the next steps of the project.
For our pipeline, we currently defined the following steps:

1. Detect face in image (done)
2. Detect landmarks in face image (done)
3. Project the detected landmarks into world space (similar to below)
4. Reconstruct point cloud of the relevant parts of the image (partially done, but not cut down to relevant parts yet)
5. Extract the corresponding 68 landmarks from Basel Face Model (done)
6. Use the 3D positions of the landmarks for Procrustes alignment to estimate the pose of our point cloud
7. Use landmark 3D positions / 3D geometry for optimizing the parameter of face shape, and expression, etc.
8. Deform the mesh to a target face to get a higher definition mesh (non-rigid ICP) (optional)

Some of these might still change, especially since we are currently looking into how the optimization step of the face model parameters might integrate with the alignment procedure.